INDIANA DEPARTMENT OF TRANSPORTATION
MATERIALS AND TESTS DIVISION

PROCEDURE FOR OUTDOOR WEATHERING EVALUATION AND APPROVAL LIST REQUIREMENTS FOR REFLECTIVE SHEETING MATERIALS
ITM No. 930-04P

1.0 SCOPE.

1.1 This procedure covers the methods that highway reflective sheeting is evaluated on the Departments outdoor weathering evaluation deck, and is placed on, maintained on, or removed from an approval list.

1.2 If the reflective sheeting materials have completed NTPEP evaluation or have been submitted to NTPEP for evaluation, the manufacturer shall submit NTPEP evaluation data to the Department as it is received by the manufacturer.

1.3 The values stated in either English or acceptable SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore each system shall be used independently of the other, without combining values in any way.

1.4 This ITM may involve hazardous materials, operations, and equipment. This ITM does not purport to address all of the safety problems associated with the ITMs use. The ITM user's responsibility is to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 AASHTO Standards.

M 268 Specification for Retroreflective Sheeting for Traffic Control

2.2 ASTM Standards.

D 4956 Specification for Retroreflective Sheeting for Traffic Control
E 991 Practice for Color Measurement of Fluorescent Specimens
E 1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry
E 1709 Test Method for Retroreflective Signs Using A portable Retoreflectometer

2.3 Indiana Test Methods or Procedures

806 Approval List Requirements

804 Sample Material Certification Forms

3.0 TERMINOLOGY.

3.1 Terms and Abbreviations. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.

4.0 SIGNIFICANCE AND USE.

4.1 This ITM is used to evaluate, approve, maintain approval, and remove from the approval listing reflective sign sheeting materials which are placed on the Department's list of approved Reflective Sheeting Materials. Each color, class of adhesive and type of reflective sheeting material will be evaluated separately.

5.0 APPARATUS.

5.1 Retroreflectometer. ART Technology, model 920 or ART Technology, model 930 in accordance with ASTM E 1709.

5.2 Spectrophotometer. BYK Gardner Color Guide 45/0 in accordance with ASTM E 1349 and HunterLab MiniScan XE- Plus 45/0 in accordance with ASTM E 991.

5.3 Calibration. Annual certification of calibration of all instruments will be done by the instrument manufacturer. Before each use of an instrument, a verification of each instrument calibration will be performed using the secondary standards that are provided with the instruments.

5.4 Outdoor Weathering Evaluation Deck. Outdoor weathering evaluation deck in accordance with AASHTO M 268.

6.0 SAMPLING.

6.1 The manufacturer shall furnish at no cost to the Department, samples of the reflective sheeting material. The reflective sheeting shall be randomly selected from a normal production run of material.

7.0 PREPARATION OF TEST SPECIMEN.

7.1 For each color, class of adhesive and type of sheeting the manufacturer shall submit eight pieces of reflective sheeting with the protective backing paper. The reflective sheeting shall be in accordance with AASHTO M 268, with the following exception: The dimensions of the reflective sheeting shall be 9 inches x 14 inches (225 mm x 350 mm). Personnel of the Department will apply four pieces of the reflective sheeting to 8 inch X 12 inch aluminum panels, according to the manufacturer's recommendations. A slit through the sheeting material will be made on one panel. The slit will be placed 2 in (50

mm) from the top and 2 in (50 mm) from the left side; the length of the slit will be 4 in, (100 mm). Each panel shall have a weather resistant label (or marking) placed on the backside of the panel. The label shall identify the manufacturer, sheeting type and adhesive class. The panels will not be clear coated after the application of the reflective sheeting material.

8.0 OUTDOOR WEATHERING EVALUATION PROCEDURE.

8.1 The manufacturer of the material shall fill out the Preliminary Product Evaluation Form in appendix A for each sheeting type, adhesive class and color of sheeting that the manufacturer is requesting to be added to the listing.

8.2 The manufacturer of the material shall submit samples with the Preliminary Product Evaluation Form, laboratory test reports, all applicable NTPEP test reports or evidence of NTPEP submissions, product data sheets, and a QCP in accordance with section 5.1 of ITM 806 to the Operations Support Division, Evaluation Engineer. The samples of the material will be used for evaluation on the Department's outdoor weathering evaluation deck.

8.3 The panel with the slit, in addition to two other panels will be placed on the test deck. The color coordinates, x & y, luminance factor, Y, and coefficient of retroreflection will be determined on each of the panels prior to installation.

8.4 The color coordinates and luminance factor of the fluorescent sheeting will be determined in accordance with ASTM E 991 using a HunterLab MiniScan XE-Plus 45/0 spectrophotometer. The color coordinates and luminance factor on all other sheeting will be determined in accordance with ASTM E 1349 using a BYK Gardner Color Guide 45/0 or a HunterLab MiniScan XE-Plus 45/0 spectrophotometer. The coefficient of retroreflection will be determined in accordance with ASTM E 1709 using an ART Technology, model 920 or model 930 retroreflectometer. A minimum of five readings for each of the color coordinates and the luminance factor will be taken on each panel and averaged.

8.5 After installation on the outdoor weathering test deck, the color coordinates, luminance factor, coefficient of retroreflection and visual observation of sheeting delamination will be determined on each panel a minimum of twice a year throughout the evaluation period. The length of time for all outdoor weathering evaluations will be in accordance with AASHTO M 268 except type I sheeting will be evaluated for thirty-six months.

9.0 CALCULATIONS.

9.1 Calculate the average coefficient of retroreflection of the reflective sheeting material for each of the panels to the nearest 1 cd/lux/m² for those materials with a coefficient of retroreflection above 10 cd/lux/m^2. For coefficient of retroreflection readings of 10, or less, the average coefficient of retroreflection will be recorded to the nearest 0.1 cd/lux/m^2.

9.2 Calculate the average of the color coordinates, x & y, to the nearest 0.0001 unit and luminance factor, Y, to the nearest 0.01% for the reflective sheeting material for each of the panels.

10.0 REPORT.

10.1 The average data for the color coordinates, luminance factor, coefficient of retroreflection and the visual observation of delamination around the slit from the outdoor weathering evaluation on each color, class of adhesive and type of reflective sheeting will be tabulated into the final report.

11.0 Reflective Sheeting Material Approval List.

11.1 Approval of Reflective Sheeting Material. A reflective sheeting material that maintains the color and coefficient of retroreflection in accordance with the requirements of AASHTO M 268 and does not delaminate through out the full duration of the outdoor weathering evaluation process of this ITM may be placed on the approval list.

11.2 Maintaining Approval. To maintain approval the manufacturer shall submit an annual certification of compliance in accordance with ITM 804 and test reports for each color, type of sheeting and class of adhesive to the Operations Support Division. A sample certification of compliance form will need to be added to ITM 804 for this material.

11.3 Removal from Approval List. Reflective sheeting material will be removed from an approval list for, but not limited to, the following reasons:

(a) Changes in the materials or production process;
(b) If three consecutive years elapse without furnishing the reflective sheeting material;
(c) Performance of the reflective sheeting no longer meets the intended purpose;
(d) Failure to annually submit certifications of compliance and test reports;
(e) Changes to the QCP without notification to the Department.

Appendix A
INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF OPERATIONS SUPPORT
PRELIMINARY INFORMATION FOR PRODUCT MATERIAL EVALUATION

Trade Name _____ Date _____

Manufacturer _____ Patented? Yes _____ No _____ Applied for _____

Address _____
Street No (P. O. Box) City State Zip Code

Representative _____ Phone No ( )_____

Address _____
Street No (P. O. Box) City State Zip Code

Product Information _____

_____

Materials Composition _____

_____

_____

** Is this product considered HAZARDOUS MATERIAL when disposing of non-used or surplus materials? Yes _____ No _____

** What is the shelf life of this material? Years _____Months _____N/A_____

Recommended Use-Primary _____

_____

_____

Recommended Use-Alternate _____

_____

_____

Advantages and/or Benefits _____

_____

_____

** Materials specifications by manufacturer, installation/operation manual, literature, test results, guarantee, hazardous material data sheets, plan, picture or sketch must be submitted with this form. In the case of electronic devices the schematic diagram, parts list, and parts layout diagram must be submitted for each printed circuit board within the device.

Meets following specifications:

AASHTO _____ _____

ASTM _____ _____

OTHER _____

Use by highway authorities or similar agencies in other states.

Agency	Years Used	Remarks
_____	_____	_____
_____	_____	_____
_____	_____	_____

** Has product ever been evaluated by and rejected for use by a governmental agency?

Yes _____ No _____ If yes, by what agency and for what reason?

_____

_____

Will demonstration be provided? Yes _____ No _____

Availability: Seasonal _____ Nonseasonal _____ Delivery at site _____

After receipt of order, are quantities limited? Yes _____ No _____

Will laboratory analysis be furnished? Yes _____ No _____

** Approximate cost _____ Royalty Cost _____

When was the product introduced to the market? _____

This product is an alternate for what product? _____

_____

_____

Will warranty be provided? Yes _____ No _____ If yes, for how long? _____

Background of company, including principal products _____

_____

_____

_____

What offices of the Indiana Department of Transportation have been contacted?

_____

Additional Information _____

_____

_____

_____

_____

(Attach additional sheets as necessary)

Person furnishing information _____
Name Title

Address _____
Street No (P. O. Box) City State Zip Code

Items marked ** MUST BE RESPONDED TO or further consideration may not be given for this product.

Please mail this form to:

Highway Support Manager
100 N. Senate Ave., Room N925
Indianapolis, IN 46204-2249

If INDOT elects to evaluate your product/material, ship samples to:

Traffic Studies Engineer
Indiana Department of Transportation
6400 E. 30th Street
Indianapolis, IN 46219-8222